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ABSTRACT

This article, in two parts, presents information as a foundation for an integrated approach to utilization and employment of Alaskan manpower in the construction and maintenance of the trans-Alaska pipeline, and the continuing exploration and development of the petroleum fields. The four primary manpower sources for petroleum related employment in Alaska are competitive recruitment within the existing employed workforce; development and utilization of the unemployed and underemployed; development of un-utilized and under-utilized potential among youth entering wage earning ages and the jobless; and worker recruitment from outside the state. The availability of unemployed and underemployed manpower and the training problems which their use would present are discussed. Estimates of size of various projects, lists of personnel requirements by occupation, and a bibliography are included. (MF)

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# Alaskan Manpower and the Petroleum-Related Workforce

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# ALASKA MANPOWER AND THE PETROLEUM RELATED WORKFORCE

## Part I.

The purpose of this article is to present a range of information that provides the foundation for an integrated approach to utilization and employment of Alaskan manpower in the construction and maintenance of the trans-Alaska pipeline, and the continuing exploration and development of the petroleum fields.

There are four primary sources to supply the manpower for petroleum related employment in Alaska:

1. Competitive recruitment within the existing employed workforce;
2. Development and utilization of the unemployed and underemployed;
3. Development of un-utilized and under-utilized potential among the youth entering wage earning ages, and the jobless; and
4. Worker recruitment outside the state.

A general description of the estimated immediate, short-term, and long-term manpower needed to construct, operate, and maintain the pipeline, superimposed over a description of Alaska's present manpower supply, may serve as a starting point for a new phase of Alaska manpower management.

One of the major problems concerning Alaska is how to develop its human resources, establish and maintain a stable and quality workforce, and at the same time decrease an excessively high unemployment rate. The problem is further compounded by the fact that unemployed and underutilized manpower is concentrated in small impoverished communities where residents are generally poorly trained and inexperienced in the wage economy. These communities are usually located in areas where there is little opportunity

to improve saleable skills. Regardless of skill level or place of residence, the sophisticated worker is rarely unable to obtain an acceptable job. Thus, there has been little pressure to seek avenues to upgrade highly specialized skills with a limited demand in Alaska.

Efforts of government and labor, in reducing Alaska unemployment, have operated from a point of view dominated by problems related to the impoverished, unskilled, and untrained workers. Small projects designed to train technicians in mining and communications have produced some highly skilled people. Generally, these programs have sought to prepare a specified number of people for a set number of job openings and have done little to upgrade the overall quality of the available workforce.

The Alaska manpower pool can be roughly divided into two categories. One group contains individuals presently included in the workforce who hold saleable skills ranging from esoteric professional skills to untrained manual labor. These people are usually familiar with job seeking and skill improvement techniques. The other portion of the state's manpower is largely untapped potential. This includes the emerging youth, unskilled and unsophisticated short-term workers, and able-bodied Alaska Natives who are seeking to join the wage economy but are not yet a part of the workforce.

A report of the Alaska Department of Labor (dated October 1969) estimates the Alaska workforce at 108,300 persons, with 8,300 unemployed. This reflects a 7.7 per cent unemployment rate and is consistent with the trend over the past five years for the workforce to gradually enlarge while maintaining a disproportionately high constant unemployment rate. In addition to the Department of Labor's unemployment statistics, a recent study focused on development of Alaska's human resources, provides evidence

that approximately 11,000 partially trained and semi-experienced Alaska Native workers are not a part of the recorded workforce.

Much of the state's urban population is characteristically transient, and present data collection and processing procedures preclude establishing a valid estimate for the number of non-Native youth which may predictively enter the Alaska job market. Analysis of available data about the Native population does provide evidence that approximately 21,000 youngsters from this group will enter the wage earning ages between 1970 and 1981.

Three recent events will affect the efficient utilization of Alaska manpower. The first is the dramatic disclosure of the petroleum discoveries on the North Slope; the second is the decision to construct the trans-Alaska pipeline system; and third, the proposals submitted by the governor to the legislature on 16 January 1970, calling for a broad program to initiate extensive public works and social capital investment projects for Fiscal 1971.

Before these events, there was neither the resources nor the demand for government, industry, or labor to assess the Alaska manpower pool expressly for the purpose of mobilizing a sizable stable workforce to fill a predictable continued employment demand. The State Department of Labor has initiated a comprehensive workforce resource and skills survey to enhance mobilization, and this may provide the foundation for comprehensive manpower planning in the future. The traditional pattern has been for business, industry, and government to depend upon an internal organization to recruit a basic core of personnel, mainly originating outside Alaska, and to subsequently recruit by local hire only a limited number to beef-up a full workforce. Efforts by the state to reduce unemployment and joblessness have relied almost exclusively upon federally subsidized work-training

projects that might lead to some kind of permanent employment for the trainee, make-work local projects, and a number of well intentioned schemes to encourage local hire through economic development. This approach was based upo a small demand by employers for that portion of the workforce with minimal skills and minimal wage occupation experience, and the national policy to reduce poverty.

For some time to come, it can be anticipated that the diverse employment needs of petroleum related construction and economic development will dominate or manipulate the job market. Exploitation of Alaska's petroleum resources can be expected to significantly and permanently alter the kinds and qualities of occupational categories required to maintain the business and industry of the state. Meeting manpower needs becomes increasingly more complex as employers compete for competent help, pressure mounts for greater movement of the impoverished and disadvantaged into the wage economy, and economic development fosters the growth of the small business community and calls for the expansion of existing organizations and agencies.

To supply the needed manpower for TAPS and other petroleum related occupations will require consideration for the limited labor intensive phase of construction of the 48-inch main carrier (the "big-inch" pipeline) and the initial stage of the installation of the feeder and gathering pipeline system to put the main line in operation. Concurrently, manpower planners will need to anticpate the expansion of the feeder and gathering system as exploration and development continues, in order to forecast the quality of skills demanded for the relatively long-term construction and maintenance process related to the exploitation of Alaska petroleum resources.

Two conditions are apparent in an evaluation regarding Alaska manpower, petroleum related economic development, and the Trans-Alaska Pipeline System (TAPS):

1. The trans-Alaska pipeline construction will begin approximately as scheduled in 1970-71, regardless of Alaska's internal problems of manpower management. The workers with the needed skills will be found by the contractors and sub-contractors, and the construction, technical, clerical, and supporting-services personnel will be located and placed on the jobs that assure successful completion of the pipeline.
2. Manning the immediate manpower needs for TAPS construction can drain the easily accessible local workforce, creating a hardship for employers throughout the state; or by widespread, "outside hire of import labor," create a situation whereby currently employed Alaska workers, many with a long future work potential, may be prevented from participating in the work related process that allows workers to upgrade or cross-train into skills classifications which are personally rewarding and in widespread continuous demand.

Although the emphasis of this paper is on manpower as it relates to oil extraction and movement, exploitation of natural gas reserves is implicit. Historically, a rich gas deposit concomitant to a rich oil discovery ultimately results in the intensive simultaneous exploitation of both. Indications are that the gas reserves on the North Slope may call for considerable exploration and development, with extensive medium- and

small-inch pipeline construction, in addition to the carriers for oil. Extraction of natural gas in Alaska, and its impact on the workforce, should be assessed in view of the 1968 report filed with the Inter-state Oil Compact Commission, which estimates: "the potential Alaska gas supply at 400 trillion cubic feet." In 1969, oil and gas conservationists were informed that the 1968 consumption of domestic natural gas reserves exceeded additions to proven reserves before the Alaska estimates were reported, and that no reduction in consumption is expected. Therefore, any activity related to Alaska gas deposits may be a vital factor in forecasting manpower needs for the state's economy. Considerable capital has been committed to feasibility studies and experimental projects in sub-surface and surface water transport for oil and gas, as well as various cross-country pipeline systems. The industry has not presently committed itself to any definite decision on the construction of additional pipelines for gas or oil, either to tidewater locations, or across Canada, except for the TAPS project. The outcome of the feasibility studies, and the decisions to be made, can alter both the present and future expectations for development and utilization of Alaskan manpower.

Considerable possibilities for a stable demand for highly skilled construction workers, technicians, and supporting personnel to serve secondary petroleum related development (in transportation or processing of raw petroleum products) should not be overlooked in long-range manpower planning. Some of the more specialized skills may apply to other petroleum related occupations or require very little worker adjustment to transfer learned skills to new or similar occupations.

Long-range planning in workforce resource development and manpower utilization cannot be based upon opinion, but probabilities and potential

for industrial development do obtain reality from similarities in parallel experiences by others. There are three outstanding examples of the immensity and complexity of the impact of petroleum related industrialization in an undeveloped area. These examples can provide a way to view the adjustments within the Alaska social and economic structure that will be required to accommodate a new economic reality. The three outstanding examples of socio-economic change imposed upon an underdeveloped area which may portend Alaska's future, are reported in the documented history, since 1946, in Kuwait, Venezuela, and Alberta, Canada. Although the first two can provide an insight into Alaska's future, Alberta offers a far more reliable parallel.

Canada's major oil production also began in an underdeveloped and underutilized region with a hostile environment -- although far less difficult from an engineering standpoint and the climatic conditions which prevail in Alaska. Like Alberta, Alaska's communication and transportation systems and the resident workforce were in the formative stages at the time of oil discovery. Attitudes of the oil industry, in relation to Alaska manpower, have been described most specifically by spokesmen for British Petroleum. One individual, in particular, has frequently compared the similarities of the Alaska workforce to the manpower available to the petroleum industry in the countries mentioned earlier. In March 1969, at the Fairbanks Regional Job Development Conference, Geoffrey Larminie (then Alaska manager, British Petroleum) stated that the oil industry is concerned for what is going to happen in Alaska relative to the best use and management of local people. He stated that his company has found that this forms the basis for an effective and economical operation. He also declared that

the time for preparation of the workforce is running out and that planning and consideration about how to integrate training to benefit the Alaska workforce to the utmost must commence as quickly as possible. This opinion has been repeated by oil industry spokesmen and several government officials many times since.

In comparison with other oil impact areas, and the other states, Alaska has a small population and a small resident workforce. Any massive change in the demands for manpower in the state will be felt first and foremost by Alaska workers and employers -- either because the workers are in great demand or because they are utilized only to fill in those occupations which industry and business do not fill by introducing an imported workforce. The quantity and quality of the resident workforce reflects the kind of workers needed before the oil discovery. Limited job opportunities and short-term intensive extraction of easily accessible natural resources have accomplished little to hasten the wholesale industrialization of the resident population of the state. By Alaska standards, there has been little need to develop and maintain a large, stable workforce to support private enterprise. Based upon the Canadian experience, as time passes, there may not be sufficient Alaska residents to fill the manning needs of the North Slope operation. Efficient manpower management calls for workers who can tolerate the harsh climate and relative isolation of the North throughout a working lifetime, and who can accept the commuter style of life that calls for regular periods of time on and off a job located some distance from the home community. The past history of colonial-style exploitation of natural resources and seasonal national defense construction may have built into a portion of the resident population attitudes responsive to the rhythms of oil field operations. The urgent task before the state appears to be

to articulate the skils areas within the petroleum industry that afford the greatest opportunity for the greatest number of Alaskans over a long period of time.

Occasionally, persons in government or business have voiced the concern that job training may over-train the number of Alaskans for a "boom-and-bust" demand. The petroleum industrial experience in other areas indicates that there is little basis for this kind of conclusion. Recognizing that census employment data can be very misleading when applied to specific categories of manpower, according to an analysis of the Alberta experience since the 1946 Leduc discovery, their labor force increased 63 per cent in the fifteen year period from 1946 to 1961, and the trend since 1961 has been an annual increase rate of 3.3 per cent, with a 5.2 per cent annual increase in the non-agricultural labor force, and a 1.1 per cent decline in the annual average annual rates for agricultural labor. It is interesting to note that between 1946 and 1964 the population in Alberta increased by 78 per cent, and that the per capita income more than doubled from $854 to nearly $1,800 during the same period. The employment index rose by 103 per cent, far ahead of the overall Canadian increase of 48 per cent, or the rise for any other province in Canada. When allowing for all the considerations involved in analyzing and applying census data to employment figures, it would still appear that the relatively small Leduc oil reserve discovery triggered a workforce demand almost greater than the total number of individuals that could be transferred from the present Alaska workforce into oil field activities. E. J. Hanson is a Canadian economist whose analysis of the impact of the petroleum industry on the Canadian economy is frequently cited by Canadian officials. He

attributes the employment increases described earlier almost exclusively to the economic impact of the Leduc oil and gas exploitation on the domestic economy of the province of Alberta.

Mr. Hanson, in a report before the American Institute of Mining, Metalurgical and Petroleum Engineers in 1966, described how the introduction of the petroleum industry into a local economy affects a chain reaction of ever-widening change. Following are a number of the factors which alter the entire complexion of a domestic economy. The petroleum industry is a large spender on a variety of goods and services. In its exploration, drilling, development, and production activities, it absorbs a very high proportion of workers in the labor force in an indirect way. First, there are many thousands of workers in the wholesale and retail trades who supply the petroleum industry with machinery, equipment, and materials. Many more service this machinery and equipment, and many others transport the equipment and supplies. These workers are direct recipients of petroleum industry outlays. So, also, are the workers engaged in constructing temporary buildings and roads in the oil fields. It is interesting to note that since January 1968, when the first producing oil well was drilled at Prudhoe Bay, that by the end of 1969, 118 miles of completed permanent year-round road had been constructed adjacent to ARCO staging area; 255 miles of good winter road were being maintained; and there were 41 work camps which could be reached by pick-up truck. In early December 1969, about 275 men were involved in road building to serve Prudhoe Bay. The search for oil on the North Slope requires a large number of transport workers of many kinds, and the climatic and topographical conditions require many kinds of adaptations and techniques. Secondly, the investment

of the petroleum industry, in its various activities, will add many workers to the construction industry. Thirdly, there are many professional, financial, and service occupational categories that will eventually specialize in petroleum oriented work (for example, geologists, petroleum engineers, lawyers, land men, and their staffs). It can be anticipated that the state and federal governments, perhaps partially financed to a substantial extent by the petroleum industries through land payments and royalties, will engage a large number of additional administrative, clerical, and construction workers. In the Alberta experience, over a relatively short span of time, the number has run into tens of thousands of additional workers. The Canadian experience also disclosed that there was the addition of considerable numbers of workers to the overall workforce dependent more or less directly upon the outlays of the petroleum industry. This additional workforce has reached into nearly every kind of industry and occupation.

Specific growth potential for private business and detailed expansion of the corporate petroleum industry within Alaska will become more clear with the passage of time. Predictions by persons experienced in petroleum related industrial growth provide some ideas for possible future direction. These include expectations for development of a petro-chemical complex at Valdez and the establishment of centers to serve the logistic needs of the North Slope at Fairbanks and other interior locations. Review of the experience of other undeveloped regions provides evidence that a steady incline in quality manpower demand is concurrent with intensive discovery and development activities. This demand can be anticipated for a lengthy and indefinite period of time. Establishing the general quality and quantity of skills to be utilized in oil field exploration and development as

they relate to construction and operation of petro-chemical plants can assist in long-range manpower planning. Evaluating to what extent the skills required in the construction of the trans-Alaska pipeline are compatible with manpower demands for continued oil field exploration and development or the workforce requirements of petro-chemical complexes may provide guidelines for comprehensive manpower training over a considerable period of time.

Additional factors which point to a continued demand for oil field workers, which includes pipeline construction, revolve around the extent of the North Slope reserves and the potential for petroleum development and exploration throughout the North. Seismographic work and drilling can be expected to continue as long as there is promise of profitable results. When discovery activities diminish, seismographic work continues and usually accelerates throughout the development phase. The overall North Slope workforce requirements will diminish proportionately as limits for exploration are defined and the various company fields enter the maintenance phase. The time needed to overcome the climatic and topographic difficulties in adapting industry procedures to arctic operations, and during construction of the big-inch pipeline with the extensive drilling and construction needed to bring the fields into production, support the opinion of oil men who estimate that the labor intensive phase of the field project operations will obtain for a minimum of 25 years. As workforce demands become more definable through the Alaska experience, it will become increasingly easier to efficiently forecast use and deployment of the northern oil field workforce. The continued exploration for oil reserves in the Arctic, and any successful results, may have a strong effect upon the Alaska

workforce and the future of manpower management planning for the state. At the beginning of 1970, Imperial Oil, Ltd., announced a major oil discovery at the mouth of the Mackenzie River. This was accompanied by a statement from the Independent Petroleum Association of Canada declaring that this discovery is sure to speed the opening of Canada's Arctic, increase the prospects for construction of oil and gas pipelines crossing Canada's Arctic, and support promotion of construction of oil and gas pipelines crossing Canada to link reserves in Alaska and Canada with markets in the interior of the continent.

Estimates about the extent of future recovery from the North Slope are cautious, but certain statements from the industry provide insight for gauging the time span manpower management can manipulate for planning workforce development and deployment. The firm of DeGolyer and McNaughton recently estimated the North Slope reserve at 50 billion barrels. Some idea of the magnitude of the fields is provided by noting that only 21 discoveries have produced a billion barrels or more. Opinion of other sources in the industry consider the 50 billion barrel estimate is overly conservative.

This volume of petroleum resource indicates a demand for an extensive workforce for exploration, development (including TAPS), and subsequent maintenance. Under presently announced plans for exploiting the North Slope, a heavy workforce demand will continue through at least four generations of workers. The trans-Alaska pipeline is to be constructed for a minimal through-put of one-half million barrels per day. The design capacity is four times that amount. It will take an unspecified period of time before the line will operate at full capacity. This, in part, may

be dependent upon the rate of progress in drilling new wells and the construction of an ever-widening feeder and gathering system hook-up to transport a constant flow of the larger volume of oil. If the pipeline were to begin operation at capacity -- two million barrels per day, or three quarters of a billion barrels per year -- it would require more than 70 years to recover the 50 billion barrels of oil.

Since the North Slope petroleum discovery, the first step in immediate and long-range planning for Alaska manpower development may be found by describing typical job components that make up a workforce demanded in oil field exploration and development and the construction of a big-inch pipeline (e.g., seismographic crews, drilling crews, construction spreads). The total workforce for the pipeline construction can be described in general terms. The oil field workforce can only be described by job description units. The total number of units to be displayed in a field is dependent upon activity levels of the various oil companies at any one period of time.

The construction process of a big-inch pipeline, except for supervisory and engineering personnel, involves a workforce with the following general characteristics:

1. Construction workers requiring a variety of skills adapted to the diameter of the pipeline;
2. Transportation workers employed in moving equipment, men, and materials;
3. Skilled equipment operators for tractors, sideboom cats, trenching and excavating equipment, and special equipment for bending, cleaning, wrapping, and coating the pipe and final testing of the line as it progresses; and

4. Welders which are engaged in a special process involving welders, spacers, stabbers, clamp men, and welders' helpers.

Present plans call for laying a 48-inch cross-country pipeline approximately 800 miles from Prudhoe Bay to Valdez, with assigned sections of construction to be approximately 100 miles long. Each section is manned by a construction spread, which is made up of a series of twelve interlocking spread crews assigned specific responsibilities within the construction process. A spread is made up of a little over 300 semi-skilled, skilled, and highly-skilled workmen. Some workmen are engaged in very specialized techniques peculiar to prototype equipment and the various specifications and sizes of pipe. During the peak construction period, present plans call for placement of seven or eight spreads on the job, and to have no less than five spreads operational during the construction season. These outfits will operate on a 10- to 12-hour day, although sun-hours and weather may affect the length of the working day. (Insert boxed tables: Components of a typical spread crew, supervisory personnel to be included.)

The following chart provides a typical breakout by employee classification according to the U.S. Dictionary of Occupational Titles, and reflects the minimum number of food service personnel required to sustain a construction force. (Insert boxed tables.)

It is estimated that approximately 17 pumping stations will be constructed. As these are constructed concurrently with the pipeline, an additional minimum of four crews of 260 to 300 men will be required. (Insert map of tentative locations of pumping stations?)

Two terminal sites are being constructed: one, the deep water facility at Valdez; the other, the shallow water staging area at Prudhoe Bay. During the period the two projects are in simultaneous construction, it is estimated that a total of 1,000 to 1,500 workers will be needed for that construction process. This does not include persons involved in transporting supplies and equipment, maintenance of portions of construction already completed or being utilized, or supplemental or supporting services for the construction workforce. This supporting, or secondary workforce, may be estimated at three persons for every man actually engaged in construction. This ratio holds true for pipeline construction as well, although industry opinion suggests that secondary support for North Slope oil fields exploration, development, and maintenance is likely to require six supporting personnel for every man in the field. The highest demand for labor during construction of the big-inch pipeline will be during the first two years, with an acceleration in demand each time a new phase of the construction is begun -- south section, central section, and the north section. Conservative estimates for the total labor force to be deployed in pipeline construction, according to sources within TAPS, runs from 5,000 to 6,000 workers. Peak employment is estimated to run as high as 10,000 individuals engaged in construction and its support. It is forecast that when the feeder and gathering system is under full-scale construction, the manpower needs will be double that of the peak requirement during the big-inch pipeline construction. Flexibility in the movement of the overall construction workforce may occur as individual contractors deploy their workforces from a completed job to another related project. If the workers on the big-inch pipeline are afforded the opportunity to adapt their skills to those in demand for

medium-inch and small-inch pipeline construction, it is reasonable to suppose that a number of these men can be transferred to the workforce which will be needed to construct the feeder and gathering systems. This latter phase will begin sometime during pipeline construction and the manpower demand can be expected to peak, and temporarily stabilize, within five years after the initial pipeline construction is begun.

Extent of the construction of feeding and gathering systems is limited only to the extent of producing wells developed. Lease sale reports will provide a gauge estimating further manpower demands in this area. It commonly requires six to ten miles of feeder pipe for every mile of big-inch pipe into which it feeds. Approximately 8,000 miles of small- to medium-inch pipe may be required in the initial support for the first big-inch trans-Alaska pipeline. The feeder and gathering systems may be diagrammed as follows:

Producing well (the beginning): well-head installation → gathering system → tank batteries → pumping station (storage site on pipeline) → out the big-inch pipe to terminal (continuously moving one-half million to two million barrels a day) → shipment to refiners and processors → consumers.

The order of construction of a gathering system is a series of interconnecting small-inch pipelines proceeding from:

well-head installation → separator and/or treater installation → heater installation → tankage (fuel storage) → transport as per flow chart above.

The preceding description of a pipeline system construction is described as a total process including laying of the pipe, building the pumping stations and tank farms, and the terminal sites. The feeder and gathering systems, including hook-up to existing productive wells, are viewed as separate construction phases although TAPS may consider both processes as a total system made up of a series of subsystems.

The pipeline construction cycle is in peak swing from March through December. Down-time normally runs from January through February and on into March. The maximum number of spreads to be activated at any one time during the peak construction period is anticipated to be five to eight. The river-crossing crews are classed as separate from the pipeline spreads. These crews normally operate during the down-time. It is presently expected that three river-crossing construction crews will be operating during the down-time period. The river-crossing crews require fifty to sixty workers. It is possible that two spreads may also operate during the down-time.

Presently, a few items can be described that relate to workforce demands during the intermediate period between the final construction phase of the big-inch pipeline, as the front-end welders move off the job; and when the various oil companies are finalizing plans for developing the proven fields. Exploration and development activity will proceed on schedules as determined by the individual companies commitments to maintain lease obligations or to acquire new holdings. A few previously isolated capped wells may become economically feasible to operate once the main transmission line is completed. These will require small-inch hook-up construction to a gathering system. There will be need of maintenance and operating personnel at the well-heads, field tank

farms, and pumping stations while the feeder and gathering network construction is in process, but before a specific oil field enters the maintenance stage. After completion, adjustments to the big-inch pipeline are expected to continue for several years. The roads and airfields along the pipeline corridor will require maintenance and service. Continued interest in obtaining petroleum and mineral leases indicates a strong probability for sustained worker demand in discovery activities in the different promising regions.

The actual numbers of the resident workforce to be engaged in the intermediate period, when the labor-intensive aspect of big-inch pipeline construction is phasing out and oil field development is phasing in, may depend upon the rate of discovery on the North Slope and adjacent areas and the time consumed in adapting to conditions that are encountered as the overall construction process is underway. The workforce requirements for the maintenance phase, in particular, will be described with the passage of time as the evolutionary accommodation of petroleum extraction to arctic conditions is accomplished.

Terminal sites at Tidewater will require all the usual service and maintenance manpower for a functioning harbor, plus maintenance of the tank farms, and a special workforce for labor intensive seasonal cargo handling. Terminal sites will require workers to maintain docking facilities, dredges, barges, and feeding and housing of workers, recreational facilities, and all routine clerical and record keeping procedures.

Throughout the investigation preceding this report, effort has been made to find comparative examples that contribute to a better understanding of the magnitude of the human effort involved in undertaking North Slope development.

A minimum of five to six thousand construction workers may be involved in building the big-inch pipeline, plus the workforce operating in the oil fields. Thus, the question of how much manpower would be required to maintain the workforce is of interest. Little useful information is available, but some idea of transport tonnage and manhours of cargo handling may be again derived from the Canadian experience. The Royal Canadian Air Force, in maintaining its remote stations similar in character to a construction camp, have found it requires a minimum of 20 tons of supplies to maintain one man throughout the arctic and subarctic winter. Too much is left unanswered on the Alaska scene, in relation to specified numbers for the development and maintenance workforce, to allow for more than a hint of the challenge to be faced in the logistics of supplying the workers dispersed over nearly 1,000 miles of difficult terrain.

The tables provide a description of typical spreads or job unit crews required on a drilling site and for seismographic work. The number of crews operating at any one time continually fluctuates. Estimating how many men will be needed in the workforce for these two types of employment becomes a matter of ascertaining the number of units of each category forecast for field deployment at any one season or time period. For the present, this information is not available.

The obstacles to be overcome in developing a manpower input and deployment model for the petroleum industry and its supporting services are many and complex, but not insurmountable. This paper has pointed out some of the variables affecting manpower planning and has suggested some ideas for approaching the development of an analytical design, either by using gross numbers, by a unit approach, or by a combination of both. Attention

has been drawn to the parallels to the Canadian experience that may assist in the determination of policies and programming related to Alaska manpower management.

Alaska has entered a new social and economic era with the discovery of petroleum deposits sufficient to affect international business, national policy, and to alter the dynamics of the local economy. The multi-million dollar expenditures and the pervasive economic impact this will have on the state are not new in the history of the oil industry. Neither are sudden riches being found in the region new to Alaska; but a modern stable industry which may affect the future of every man, woman, and child in the state is unprecedented. Foreshadowed, in part, by what is known about petroleum related socio-economic impact in an under-developed area, the response of business, government, and industry to planning for immediate labor intensive, intermediate, and long-term workforce demands may determine the diversity and limitations of present and future occupational choices afforded the Alaskan population. The wheels have been put in motion for Alaska's industrialization on a major scale. To what extent the resident workforce will participate in the process is ultimately up to those who determine and execute the policies of manpower management for the State of Alaska.

The Canadian experience in establishing procedures of obtaining a qualified petroleum related workforce is well documented. Part II of this article will describe some of that history and indicate how Alaska may borrow from the history of another's success to establish a program of human resource development uniquely tailored to Alaska's life-styles and the anticipated manpower needs to support anticipated industrialization.

PERSONNEL FOR A TYPICAL NORTH SLOPE SEISMIC PARTY

NORTH SLOPE FIELD CREW

| | |
|---|---|
| 1 | Party Manager |
| 1 | Assistant Manager |
| 1 | Observer |
| 1 | Junior Observer |
| 8 | Recording Helpers (Jug-Hustlers) |
| 12 | Drills (1 Driller, 1 Driller's Helper -- 5 or 6 drills per party) |
| 2 | Cat Skinners |
| 2 | Mechanics |
| 2 | Helicopter Pilots |
| 2 | Helicopter Mechanics |
| 1 | Flight Support Pilot (fixed wing) |
| 31 | Field Party (agerage) |
| 2 | Camp Attendants |
| 1 | Cook |
| 1 | Cook's Helper |
| 4 | Supporting Services |
| 35 | FIELD OPERATIONS PERSONNEL |

SUPPORTING SERVICE - intermediate location (usually Fairbanks)

| | |
|---|---|
| 2 | Expeditors |
| 2 | INTERMEDIATE OFFICE PERSONNEL |

CENTRAL OFFICE (usually Anchorage)

| | |
|---|---|
| 1 | Party Chief |
| 1 | Superintendent |
| 1 | Geophysicist |
| 7 | (or 8) Clerks |
| (10) | CENTRAL OFFICE PERSONNEL |
| 47 | TOTAL WORKFORCE (average) |

SOURCE: Alaska Department of Labor, 1970.

## PERSONNEL REQUIRED FOR TYPICAL NORTH SLOPE DRILLING CREW

Workers are employed on two shifts, with a third full crew attached to a rig acting as a swing-shift when another crew is relieved. Drilling is a 24-hour, 7-day a week operation.

Ranked in the order of skill proficiency requirements:

| | RIGMEN | |
|---|---|---|
| 3 | Drillers | |
| 3 | Derrickmen | |
| 3 | Motormen | |
| 3 | Mechanics (occasionally only two are assigned to a rig) | |
| 3 | Lead Tong Men | Roughnecks |
| 3 | Backup Tong Men | |
| 4 | Roustabouts | |

| | SUPERVISORS |
|---|---|
| 3 | Toolpunchers (occasionally only two are assigned to a rig) |
| 1 | Engineer or engineering technician (usually an oil company employee) |

| | SUPPORT SERVICES |
|---|---|
| 3 | Cooks |
| 3 | Cook's Helpers |
| 3 | Bull Cooks |
| 3 | Water Haulers (occasionally only two are assigned to a rig) |

36 to 38 workers TOTAL

SOURCE: Nabors Drilling Company, August 1969.

## TYPICAL SPREAD COMPONENTS FOR BIG-INCH PIPELINE CONSTRUCTION

1 Spread Boss

1 Straw Boss

Crew Supervisors:

- Spread Man (R.W. Foreman)
- Top Ditch Man (Clean Up)
- Tie-In Man
- Pipe Man
- Dope Man

12 Spread Crew Foremen:

- Right-of-Way Clear
- Pipe Stringing
- Bending
- Welding
- Lower-In
- Tie-In
- Clean Up
- Right-of-Way Grade
- Ditching
- Pipe Tack
- Coating
- Backfill
- Testing

Additional Specialists:

- X-ray Men (approximately four per spread)

Surveyors (five per section before construction, two or three during construction).

Inspectors (oil company employees or agents and government and agency personnel -- number unspecified).

SOURCE: Information compiled from interviews with the pipeline construction industry.

PERSONNEL REQUIRED FOR TYPICAL PIPELINE SPREAD

| Number Required | Classification |
|---|---|
| | **CONSTRUCTION PERSONNEL** |
| 52 | Bulldozer Operator<br>Motor Grader Operator<br>Ripper Operator<br>Loader Operator<br>Boom Operator<br>Tow Cat Operator<br>Back Hoe Operator<br>Crane Operator<br>Ditching Machine Operator |
| | Dragline Operator<br>Clean-Prime & Wrap Machine Operator<br>Horizontal Bore Machine Operator |
| 2 | Bore Machine Helper |
| 15 | Labor, Hoisting |
| 30 | Swamper (Helper) |
| 20 | Oiler |
| 10 | Hooker |
| 6 | Truck Driver - Dump |
| 20 | Truck Driver - Trailer |
| 17 | Truck Driver - Light |
| 3 | Blaster (Powder Man) |
| 6 | Blaster (Helper) |
| 6 | Mechanic (Construction Equipment) |
| 10 | Mechanic (Helper) |
| 4 | Air-Hammer Operator |
| 70 | Welder, Arc |
| 3 | Welder, Fitter (Lay Out) |
| 5 | Welder, Combination (Arc & Gas) |
| 78 | Welder, Helper |
| 1 | Clamp Man |
| 1 | Stabber |
| 2 | Spacer |
| 30 | Laborer |
| 2 | Clerk - General |
| 1 | Clerk - Material |
| 1 | Secretary |

| Number Required | Classification |
|---|---|
| | **CONSTRUCTION PERSONNEL (continued)** |
| 1 | Warehouse Man |
| 1 | Foreman, Right-of-Way |
| 1 | Foreman, Clean Up |
| 1 | Foreman, Ditch |
| 1 | Foreman, Weld |
| 1 | Foreman, Bend |
| 1 | Foreman, Lower-In |
| 1 | Foreman, Tie-In |
| 1 | Foreman, Water Crossing |
| 1 | Foreman, Back Fill |
| 1 | Foreman, Labor |
| 4 | Inspector, Weld |
| 1 | Inspector, Coating |
| 1 | Inspector, Holiday-Detector Operator |
| 5 | Inspector, Pipeline Construction |
| 417 | Total Construction Workforce |
| | **SUPERVISORY PERSONNEL** |
| 1 | Superintendent |
| 1 | Assistant Superintendent |
| 1 | Office Manager |
| 3 | Total Supervisory Personnel |
| | **CATERING SERVICE PERSONNEL** |
| 11 | Cook, Camp |
| 17 | Kitchen Helper |
| 14 | Camp Attendant<br>Bull Cook<br>Choreman<br>Bed Maker |
| 1 | Barber |
| 3 | First-Aid Attendant |
| 2 | Washer, Machine (Laundry) |
| 4 | Watchman |
| 2 | Flagman |
| 2 | Auxiliary - Equipment Operator |
| 56 | Total Catering Service Personnel |
| 476 | TOTAL MANPOWER PER SPREAD |

SOURCE: Dictionary of Occupational Titles and Classifications, Volumes I and II, Third Edition, Published by the U.S. Department of Labor.

# ALASKA MANPOWER AND THE PETROLEUM RELATED OCCUPATION: PART II

Laurel L. Bland

In 1946-47, a major oil discovery occurred in Alberta, Canada. Immediately a number of Canadian government agencies, corporations, and individuals became vitally concerned with the factors of producing, processing, and marketing a valuable non-renewable resource in an underdeveloped sparcely populated region in North America. Manpower became a major concern, including the importation of labor, recruitment and maintenance for the needed stable workforce, and development of the means for handling immediate labor demands while promoting a balanced process for meeting future labor needs. The solution was largely an evolutionary process, and one which is still going on. Alaska now faces similar problems in supplying needed workers for petroleum related employment, and an expanding and more technically adept resident workforce for the near future.

The general philosophy in the United States, as in Canada, is to facilitate "free enterprise", and in the U.S., to insist upon equal employment opportunity for all workers. On the premise that the most important resource in Alaska is the human resource and since participation of the local workforce in the oil industry has become a public issue, valuable lessons for Alaska may be contained in the history of Canada's adjustment to the oil industry's manpower needs. Manpower management projects to be undertaken must be viewed in the light of assisting industries to develop and concurrently to assist the individuals involved to advance themselves to a level commensurate with their ability. In this way, the Departments of Education and Labor become directly involved as industry requires trained personnel in order to be competitive in today's market. In Alaska, under the novel experience of an

emerging rearrangement of the internal economy, it is unrealistic to expect publically supported training and educational institutions to instantly adjust policies and programs to meet the changes brought on by the oil industry. A responsibility of these public institutions is to be concerned with the entire range of immediate and future job training needs within the periphery of the local economy; yet undue concentration on any one aspect of the wage economy at the expense of others must be avoided. In addition, operating budgets and staffing for state and federal agencies in Alaska are historically strained to accomplish preassigned tasks. These agencies and their departments are prohibited by regulation and internal organization from adopting flexible processes which will permit an expedient combining of efforts and/or of funds of two or more types of departments or agencies in a quick response to a new workforce requirement.

Much concern at state and federal levels has been expressed regarding fair and equitable solutions to providing greater opportunity for Alaska Natives to join the workforce. Oil industry spokesmen have publicly praised the workmanship and abilities of Native workmen attached to some of the North Slope exploration and test crews. An industry oriented approach to an intensive training program, with promise of permanent well paying jobs after completion, may greatly increase movement of the Native workforce potential into Alaska's manpower pool. The greatest number of jobless and unemployed persons exist among the Eskimos, Aleuts, and Indians. An initial short-term intensive training program, geared to entry-level pipeline construction jobs and oil field work, may provide a vehicle whereby more Alaska Native people, as well as others, can gain needed sophistication in specialized skills. Such training can provide an acquaintance and

orientation for skills and habits required from workers who are part of a precisely coordinated crew.

Training involved in preparing the workforce for petroleum industry employment can be of several types:

1. Short-term intensive ("crash") training programs to meet critical shortages of skilled personnel in certain areas--particularly entry level skills to reach the unemployed, underemployed, and jobless; and upgrading or cross-training within specific skills categories to permit resident skilled labor to compete for high paid specialized jobs new to the Alaskan scene;

2. Upgrading of the unemployed or underemployed to meet industry's rising standards in occupations similar to those listed above;

3. Continual upgrading of employed persons to enable them to cope with technological changes and thus stay employed;

4. Technician programs to meet the continuing needs of industry through professional training at the university level.

Table I
OIL INDUSTRY OCCUPATIONAL COMPOSITION

Certain over-riding policies must guide any planning that seeks to constructively alter existing manpower conditions and training policies. Manpower training, regardless of its duration or possible expansion and growth, should be guided by policies regarding:

a. permanent utilization of the trainees in the best interest of the individuals and overall human resource development of Alaska;

b. a planned program which includes evolving conditions and

TABLE I

PROFESSIONAL, TECHNICAL, AND MANAGERIAL OCCUPATIONS BASED UPON JOB ORDERS PLACED WITH THE ALASKA STATE EMPLOYMENT SERVICE

mid-1968 to mid-1969

| GENERAL PETROLEUM | Demand |
|---|---|
| Petroleum Technician | Light |
| Observer, Seismic | Light |
| Observer | Light |
| Drafts Man, Topographical | Light |
| Surveyor | Moderate |
| Geophysical Prospector | Light |
| Prospector | Light |
| Weather Observer | Light |
| General Foreman | Light |

| CLERICAL | |
|---|---|
| Clerk, General Office | Light |
| Accounting Clerk | Light |
| Expeditor | Moderate |
| Cook, Full Dinner | Light |
| Baker | Light |
| Cook, Camp | Heavy |
| Kitchen Helper | Light |
| Camp Attendant | Heavy |
| First Aid Attendant | Light |

| MACHINE TRADES | |
|---|---|
| Engine Equipment, Mechanic | Moderate |
| Mechanics Helper | Light |
| Mechanic, Diesel | Light |

| STRUCTURAL WORK | Demand |
|---|---|
| Welder Arc | Light |
| Welder, Comb | Light |
| Mechanic, Electronic | Light |
| Bulldozer Operator | Light |
| Motor Grader Operator | Light |
| Driller, Waterwell | Light |
| Operating Engineer | Moderate |
| Carpenter, Rough Construction | Light |
| Laborer, Plumber | Light |
| Roustabout | Heavy |
| Construction Worker | Moderate |

| MISCELLANEOUS OCCUPATIONS | |
|---|---|
| Truck Driver, Light | Light |
| Deck Hand, Seismic Boat | Light |
| Motormen | Light |
| Rigger | Moderate |
| Laborer, Stores | Light |
| Material Handler | Moderate |
| Tool Pusher | Light |
| Prospecting Drilling, Derrick Man | Heavy |
| Roughneck, Rotary Driller Helper | Very Heavy |
| Driller Helper | Moderate |
| Hoist Operator | Light |
| Observer Helper | Very Heavy |
| Laborer (Miscellaneous) | Heavy |
| Rotary Rig Engineman | Moderate |

Source: ALASKA MANPOWER OUTLOOK - 1970's, Alaska Department of Labor, September 26, 1969

the changing experience of government, industry, and labor;

c. protection of the wage earning capacities of individual trainees by anticipating and providing for retraining or cross-training into new career fields for those with obsolete or outmoded skills.

Some of the manpower training described herein may be at the university level; but generally the following comments do not apply to the professional level of training.

Manpower training must be in constant continuing contact with industry. Only in this way can courses be kept relevant to industry's needs and new technological innovations. Thus, all courses should have advisory boards comprised of representatives of industry, labor, and any technical institutes. Revisions may then be made to the courses upon the advice of these boards. Other than for revisions, courses in technical training are fairly stable and course enrollments can be changed so the labor market does not experience either extreme shortages or oversupply.

A brief history of Canadian response to petroleum-related training needs may provide a guideline for approaching a similar situation in Alaska. Many operations within, and supportive to, the petroleum industry require high degrees of technical skill. Much of this kind of skill proficiency for persons already working can be gained on the job or through on-the-job training. Opening up initial employment for the unskilled or minimally trained may be one of the most difficult of Alaska's problems. Another problem has been the instituting of recently initiated OJT (on-the-job training) projects operated by the Department of Labor and the Alaska Federation of Natives.

Now in the formative stages, Alaska's oil industry complex does not

have the time to engage in direct training programs. Canada soon recognized that industry's internal training programs are limited for a number of reasons and concluded that it is not economically sound to leave the whole job of industrial training to job-tied work experience programs. Canadian officials accepted that the oil industry is dynamic in nature and must continually retrain its personnel to keep pace with technological change.

Many people in Alaska are now concerned about the effect of import labor on the local workforce. Canadians, too, were faced with reconciling unemployment, workers deficient in skills demanded by the petroleum industry, and an industry committed to a costly process of exploiting a new major petroleum reserve. The growth of the Canadian Pipeline Contractors Association and their involvement in manpower training is a good example of one response to the problem.

In 1949, six Canadian drilling contractors pooled some of their resources to initiate a safety education training program. These early activities eventually became the foundation for the Petroleum Industry Training Service (P.I.T.S.). In 1953, P.I.T.S. was reorganized combining the joint efforts of the Canadian Department of Mines and Minerals, the Department of Extension of the University of Alberta, the Western Canadian Petroleum Association, and the Canadian Association of Oil Well Drilling Contractors. The sponsoring Associations made cash donations towards starting and maintaining the Service and continue to do so to this day. In September 1961, P.I.T.S. became an autonomous body, fully incorporated under the laws of Canada and controlled by a Board of Directors. This Board is responsible for

the administration of the organization and, in turn, each member is responsible to his respective sponsoring group.

Prospects for a pipeline construction industry in Canada first emerged in 1947. Continued exploration for oil uncovered vast natural gas and oil reserves which made feasible the construction and installation of Canada's major pipeline systems. The construction of the Interprovintial Pipeline (oil-1950), the Alberta Gas Trunk Line (1956-57), the West Coast Gas Transmission Line (1956), the TransCanada Pipeline System and the Saskatchewan Power Corporation pipeline (gas-1957-58) provided the major interprovintial network. A number of lengthy transmission lines of varying sizes have been built since, and pipeline construction has been offered a sustained demand for workers. The chart below outlines pipeline construction reported in 1966 to be in the planning stages for 1967.

Table III

1967 CANADIAN PIPELINE CONSTRUCTION FORECAST

TRANS CANADA PIPE LINE LTD.:

130 miles of 34" loop program for Eastern Canada
124 miles of 26" main line in Eastern Canada
40 miles of 10" extension - Eastern Canada to the U.S.A.

TOTAL 294 miles - estimated Spreads 3

INTERPROVINCIAL PIPE LINE LTD.:

171 miles of 34" loop in Western Canada
- estimated Spreads 2

ALBERTA GAS TRUNK LINE:

75 miles of 30" main line construction
50 miles of gathering system
175 miles of 30" - 36" main line construction (1967-68)

TOTAL 300 miles - estimated Spreads 5 - all in the Province of Alberta.

TRANS MOUNTAIN OIL PIPELINE CO. LTD. :

100 miles of 30" loop in Western Canada
- estimated Spreads 1

WESTCOAST TRANSMISSION PIPE LINE:

120 miles of 36" loop program
56 miles of 18" - 24" extension
___ 100,000 horsepower compressor station expansion

TOTAL 176 miles - estimated Spreads 2

PACIFIC NORTHWEST PIPE LINE CO. :

410 miles of 12" main line construction - Prince George to Prince Rupert in British Columbia
- estimated Spreads 4

Of the total quantity of 17 Big Inch Spreads of equipment required to construct the foregoing projects, it is estimated that at any one time 10 Spreads of equipment will be working, involving a total work force of 3,400.

Source: Pipeline Contractors Association of Canada, A CENTENNIAL YEAR PREVIEW, June 16, 1966.

Although many of the contracting companies engaged in the construction of the first major pipeline systems were American (or American in origin), the present contracting force in Canada is now Canadian. Twenty-six

companies were operational by mid-1966, although in the early 1950's American personnel made up 85% to 90% of the supervisory and skilled classifications of workmen required on Canadian pipeline jobs. The Pipeline Contractors Association credits the change from "outside" to "inside" workforce to leadership by the Association in establishment of training programs in liaison with Vocational Training directors in the affected provinces. Early manpower training placed the initial emphasis upon welding and safety training but soon offered a wide range of technical training.

Table II

TYPES OF COURSE OFFERINGS
EXAMPLES FOR A SUSTAINED TRAINING PROGRAM

1. Oil rig training:
   - A. floor man technician
   - B. motor man technician
   - C. derick man technician
   - D. driller technician
2. Management and development training:
   - A. supervisory and foreman training program
   - B. distribution and utilization of natural gas
   - C. gas and oil production and transmission
   - D. unit operations
   - E. oil refinery and utilization
   - F. fundamental petroleum reservoir technology
   - G. fundamental improved recovery technology
   - H. evaluating well performance technology
   - I. fundamental gas technology

J. field handling of natural gas

K. lease operations

L. unitization

M. geophysical shooters course

N. special oil well boilers

O. B.O.T. and control

P. D.C. industrial first aid

Q. derick man and upgrading

R. instrumentation short course

S. pipeline welders inspection course

T. pipeline electrical maintenance course

U. handling and firing of explosives for seismec operations

V. semi-automatic shield pipeline welding

W. blow out prevention

X. and numerous other categorized training courses in keeping with industry's needs.

Source: Petroleum Industry Training Service, Alberta, Canada--Course Outlines, 1969.

A comparison of the Canadian/American proportions of the pipeline workforce on two projects, one in 1958 and one in 1961, according to Canadian opinion, reflect a change brought about in only three years because of the emphasis upon the P.I.T.S. training programs. It should be noted, however, that four times as many spreads were employed in the intensive construction for the 36" trans Canada pipeline than were employed on the gas trunk line in 1961. The trans Canada line is somewhat analogous

to the trans-Alaska line, inasmuch as it was the key factor to "open up" a new petroleum reserve. A 1967 survey of Canadian Union locals, with all responding but two, indicates a significant changeover from American to Canadian welders on Canadian pipeline jobs. In 1967, with 551 experienced pipeline welders listed with the locals, the Pipeline Contractors Association found there would be a "serious shortage" of pipeline welders for the 1967 construction season in Canada.

Table IV

SURVEY OF CANADIAN WORKFORCE 1958 and 1961

| 1958 | 1961 |
|---|---|
| Project: The Trans Canada Pipeline August 1958 | Project: Construction of Extensions to Alberta Gas Trunk Line and Alberta Natural Gas Co. Line for Export of Gas to California - July 1961 |
| Crew: 12 Big-Inch Spreads and 4 Small-Inch Spreads | Crew: 2 Big-Inch Spreads and 2 Small-Inch Spreads |
| Total Workforce on the 16 projects 3,437 | Total Workforce on 4 projects 906 |
| Total number of Americans 443 | Total American Personnel on Temporary Work Permit 27 |
| Percentage of Americans 12.88% | Percentage of Americans 2.87% |
| Total number of Welders employed 237 | Total number of Welders employed 93 |
| Total number of American Welders 62 | Total number of American Welders 1 |
| Percentage of American Welders 26.07% | Percentage of American Welders 1.07% |
| Total number of Operators 690 | |
| Total number of American Operators 166 | |
| Percentage of American Operators 24.11% | |

Source: A Centennial Preview, Canadian Pipeline Contractors Assn., 1967

The 551 welders do not include stabbers or spacers, or any welders other than those specializing in pipeline welding.

Big-inch and small-inch mainline construction is not the only construction demanding pipeline welders, although big-inch systems require a more highly skilled workman. Welders are in continuous demand during construction season, for flow lines (small-inch pipelines from well-head to tank batteries), gathering systems (a series of small- to medium-inch lines from wells in a field to a central gathering point or battery), small-inch transmission lines (line from battery or gathering system to a mainline), and natural gas distribution systems or extensions (lines laid to domestic and industrial users of natural gas). It is not known at this time how many miles of Alaskan pipeline will be laid for oil or gas, but fear expressed in the press that Alaska may over-train welders, seems questionable in the light of Canada's early emphasis upon training in this single skill.

Canadian methods of financing, as in the United States, are complicated. In Canada they involve both the federal government; represented by the Canadian Department of Manpower and Immigration, and the provincial government; represented by the Division of Technical and Vocational Education. In Alaska, primary involvement in manpower training concerns the federal

and state Departments of Labor and the federal and state Department of Education.

The Province of Alberta has signed an agreement with Manpower whereby the province arranges training courses for adults, and Manpower places adults into these courses and pays them allowances. Part of this agreement also allows Manpower to pay for the cost of training and wage reimbursement for companies having an in-service training program that has been approved by the province. In addition, the province has a complimentary program whereby it can assist those people not acceptable to manpower either in regular training programs or in "training and industry" (OJT) contracts. This is very similar to the system employed in Alaska.

The Canadian oil industry, through its professional associations, has formed four special interest groups or committees directly concerned with manpower training. These are related to oil production, gas production, pipeline construction, and drilling. These are groups which now direct P.I.T.S. and have assumed responsibility for both quantity and quality control of instruction and course offerings. Vocational Education in Canada works closely with P.I.T.S. and with the representatives of the four association advisory groups.

Largely through the efforts of the petroleum industry, via P.I.T.S., a permanent technical training center has been established within the City of Edmonton, Alberta. Construction should be fully completed in 1970. To date, there is a "big-rig" sitting over a 3,000 foot hole, another hole 600 feet deep over which can be placed a "service rig", and temporary class, rooms and a shop area. According to present plans, the completed Alberta Petroleum Industry Training Center will be operated by the Division of

Technical and Vocational Education - Department of Education, for courses at a level less then the usual two year technician programs also sponsored by P.I.T.S.. It will be involved in sustained programs and crash programs as required in a cooperative project between industry and government. Industry lends specialized equipment and schools such as rigs, pumps, blow-out preventers, and power units since it would not be economical for government to buy this equipment. Industry advises the center of their manpower needs, the types of courses required, course content, and priority of course scheduling. From this information, P.I.T.S. will devise and operate the necessary courses.

A recent development in the drilling industry in Canada caused the P.I.T.S. advisory group to set up a special "Technician" certification program. Industry offers a differential wage scale for those taking programmed courses through the P.I.T.S. training center.

Alberta has been involved in short-term intensive ("crash") training programs to meet certain critical situations, notably, a course for big-inch pipeline welders when pipelines were first being laid in Alberta. Here, industry supplied the welding equipment and provided top personnel as instructors, the school supplied instructors wages, rod, space, training allowances and operating costs; and the pipe manufacturers supplied the pipe. The same situation occurred again when "gas-shield" welding came into use in laying pipe. It is possible that the initial training in petroleum related skills for the Alaskan workforce might follow a similar line, if dialogue with the industry discloses that the North Slope construction will create a demand for pipe welders similar to that of the Canadian industry.

Alaska does not yet have the various petroleum related professional associations, or an oil well drilling contractors association, with the degree of wealth or power enjoyed by the Canadian organizations. Passage of time may disclose the approach to exploration, development, and production of petroleum will be patterned somewhat different from that occurring in Canada just as manpower management and potential are presently at variance. A major difference between the situations faced by manpower planners in the two areas is Alaska's concern with high unemployment and utilization of the indigenous jobless labor force. A part of this concern rests in the direct involvement in manpower development by the federal government--particularly the Bureau of Indian Affairs and the Office of Economic Opportunity--as well as several departments of the state concerned with economic development as it relates to the environment and the human resources.

It may become evident, if a workable solution to comprehensive manpower development within Alaska is to be acceptable to both industry and government, that the petroleum industry workforce must be developed through a neutral entity like a technical institute. Any institution which serves the manpower needs of the petroleum industry in Alaska, but which equally serves in the public interest by augmenting existing training and education programs is desirable. A private organization which enables the state to obtain greater returns from existing education and training services can be an economic asset to the state. If it additionally contributes substantially to the efficient and economic growth of a diversified Alaskan petroleum industrial complex and a high quality resident workforce, it becomes a profitable investment for both private and public support. It appears that eventually

a similar public or privately financed organization, modeled after P.I.T.S., and directed and administered by an appropriately "Alaskanized" board of directors, might prove to be the most efficient answer for developing Alaska's oil and gas industrial workforce. The period during institutionalization would determine early decisions about course offerings, and expansion of services could be made as the demand and capacity of the organization permit. The first priority of the organization may be intensive short-term training for unskilled and semi-skilled labor needed for pipeline construction, job-specific clerical and record keeping skills, and orientation for food handling and industrial safety. These, according to industry spokesmen, are the workforce areas where the most people are needed and the greatest number of job vacancies are expected to occur. The organization should not expect to teach a "trade" within the conventional meaning of the term, nor should courses be intended to qualify trainees as "tradesmen". Courses would be offered either as a result of industry or governmental request or if the need for a course has been clearly demonstrated. The Alaskan organization, as a non-profit industry controlled and directed training institutions, would be concerned with training personnel for the oil industry from entry level positions to upgrading or cross-training those already employed in the industry.

Under its board of directors, the organization would consist of an executive committee responsible for decisions and administration, an executive director, and the required staff. Included in executive committee responsibilities would be formation of the training committees. Examples for specific areas of training committee jurisdiction include construction,

drilling, production, pipeline, gas and geophysics. Members of each committee would work directly with the permanent staff of the organization in assessing training needs and whether or not a problem can be solved by a collective approach. When circumstances warrent, more specific problems in manpower needs may be passed on to various industrial or agency sub-committees for further analysis and development. The function of training services of the administrative staff would be essentially one of liaison and coordination. Once the organization has approved the implementation of a course, the administrative staff becomes responsible for obtaining course material, contracting with instructors, advertising, registration of candidates, and general coordination of interest and effort. In all cases, the decision of whether or not a particular course is to be instituted rests with the special interest committee involved, and action should be predicated upon a philosophy of first utilizing already established institutions and systems for training workers.

Courses not in keeping with public funding that may be provided by the organization probably would be of short duration (e.g. conferences or seminars) which give intensive coverage to specific subjects such as management techniques or introduction of new equipment. It is possible to generate programs that for a variety of reasons may require two or three years for candidates to complete. For example, there might be devised a program for welders whereby they may take two courses per year for a period of six years to obtain a technician's diploma in welding. Up to now courses in different aspects of welding have been offered in Alaska, but such training is often not recognized beyond the MDTA program in which it was taken.

Courses taken through an industry directed organization, as described previously, would command greater employer acceptance since they are, in fact, prescribed by the industry.

Courses to be offered by the organization would not normally be available at existing educational institutes. Thus, the organization would act as a complimentary, rather than a competitive, educational organization, and should work very closely with the various established institutions to obtain maximum utilization of physical plants and local resources. For instance, courses might be held cooperatively with Alaskan community colleges and include intermediate level courses in field supervision, crew foreman, pipeline welder, inspector, and pipeline electrical maintenance. In recent years, P.I.T.S. has complimented the services of established Canadian education and training institutions. They have been instrumental in outlining, (and subsequently advising) during the implementation of special courses at the Southern Alberta Institute of Technology, and the Oilwell Drilling School which is sponsored by the Alberta Department of Education. It is reasonable to envision a similar cooperative working arrangement for an Alaskan organization to develop between a new technical institute and the University of Alaska the Community Colleges and the Bureau of Indian Affairs, the Alaska Federation of Natives and the Cooperative Manpower Area System for Alaska. In this way, the overall function of an Alaskan petroleum related training organization would be to receive, coordinate, and implement training directives from petroleum industry; serve as a liaison and catalyst; and be the responsible and recognized administrator of projects for government and industry. This has worked well in Canada, according to spokesmen for both

government and industry, due to the total involvement of industry at all levels through active participation in committee work, course design, and instruction. Although little mention has been made of organized Labor, Union support and participation is a vital factor in the successful foundation and operation of an integrated manpower training program.

Table V

AMERICAN WORKERS, ORGANIZED LABOR AND PETROLEUM RELATED EMPLOYMENT

In the U.S., approximately 185,000 workers are employed in the petroleum refining industry and it is estimated that more than 80 percent are covered by collective bargaining agreements. About one-half of the organized workers are represented by the Oil, Chemical, and Atomic Workers (AFL-CIO), which generally represents all production and maintenance workers in a facility. The next largest group of organized workers is represented by affiliates of the National Federation of Independent Unions, made up of organizations usually limited to a single plant or company. In other instances, the various crafts are represented by the Boilermakers, International Brotherhood of Electrical Workers, Painters, Plumbers, Operating Engineers, Hod Carriers, Iron Workers, Carpenters, and Teamsters.

Unions affiliated with the AFL-CIO receive their charters from the Federation and each specifies a jurisdiction, although at times unions expand beyond and across jurisdictional lines. In essence, it depends on which union does the organizing and what the bargaining unit is as determined by the National Labor Relations Board.

Source: U.S. DEPARTMENT OF LABOR, BUREAU OF LABOR STATISTICS in a letter dated August 20, 1969.

Unions normally resist any program which will provide employment or means to enter employment that is generated outside their own training programs--or which reaches those outside their existing membership. The Pipeline Contractors Association of America has a three year renewable agreement

with the Internationals including the Hod Carriers, Pipe Fitters, Operating Engineers, and Teamsters. At this level, training which leads to promotion of needed skills, advancement of union members, and highly skilled specialization under union jurisdiction is encouraged. Union locals in Alaska may not yet be aware of the scope and coming demand for workers needed now and in the future in the crafts and trades areas over which they hold jurisdiction. There are several priority demand skills in the petroleum industry which are not now available through the locals. Preliminary inquiry has not disclosed any existing means of training sufficient numbers in the highly specialized skills demanded by pipeline construction contractors. Thus, industry is led to the conclusion that importation of labor in an area of remarkably high unemployment is the only means of obtaining what must be had to meet manpower demands. Specific examples are the welding and heavy equipment operation specialty skills. Big-pipe welding, and operation of quarter-million-dollar prototype machines for ditching are unfamiliar to Alaska workers. Alaska does have, however, a fairly large but undetermined number of both union and nonunion workers holding varying degrees of skill in these general areas. Industry opinion indicates that a retraining or upgrading of skills into specific proficiencies must occur before Alaskan workers in the general workforce can be placed in any real numbers on petroleum industry related jobs.

Local controversy exists on this point.

Nevertheless, it seems to be generally agreed that if available workers were to own proof of proficiency acquired under instructors qualified by the industry and/or unions, those men would be acceptable by the industry

and their contractors. Furthermore, industry spokesmen frequently state emphatically that they would prefer a permanent local workforce to provide manpower from the exploration, development, and maintenance phases of the oil fields as well as for any refining or processing to be done in Alaska.

Notice should also be taken of the anticipated greatly increased demands for longshoremen skills--most particularly deck hands and cargo handlers--required to sustain the activities at the pipeline terminal sites. Preliminary research by the writer indicates this may be a fertile area for development of entry level jobs of seasonal intensity. Employment may be actively encouraged through short-term job orientation and safety training programs to certify minimum proficiency for local-hire resident deck hands and cargo handlers.

It appears from comments in the public media, that awareness of the accelerating demand for many categories of Alaskan manpower is being slowly recognized in different ways by a number of individuals and organizations. In order to establish a practical and orderly approach for channeling some of the resident workforce potential into the petroleum related employment it presently appears that government, industry, business, and the Native special interest groups, by acting cooperatively through individual representatives, may need to supplement existing leadership in manpower resource development until the established educational and training procedures can gain momentum. Various interests, such as the oil companies, Associated General Contractors, Union Locals, and government agencies are attempting to conduct limited training programs to help fill labor needs as they are perceived. This approach is both excessively costly on a per trainee basis and is seriously limited since it encourages dissipation of available training

resources in industry and encourages interagency competition for public funds allocated to manpower development. It appears that the petroleum industry offers a wide variety of jobs at entry level positions, as well as other skill levels, although the exact numbers within occupational categories are not yet determined. A previous report describing the manpower needs accessment for petroleum related employment indicates that the size of the workforce is significant when compared to the total numbers of Alaska's population and the resident workforce potential. A manpower training contracting organization, similar to that which has been developed in Alberta, designed in the best interests of the resident workforce and the petroleum industry, is one avenue to reducing chronic and disproportionate unemployment in the state. It also extends a particularly appropriate kind of employment opportunity to many of Alaska's Native people, since a high percentage of long-term jobs are attended by seasonal and commuter patterns of worker deployment, and are located in isolated arctic and subarctic regions. Efforts by individuals in government and industry to take advantage of the Canadian manpower training experience may insure that the petroleum related workforce in Alaska is primarily a resident workforce. Individual members may, in this way, become firmly and fully established in a dynamic industrial complex that offers jobs in almost limitless variety throughout the world. Manpower planning in Alaska, in order to play a primary role in social progress, economic development, and to aid in reduction of the numbers of physically able persons dependent on welfare expenditures has the opportunity to formulate a policy based upon contemporary experience of others. A mandate for action appears to be needed in view of

the established but presently limited systems of manpower training and a clearly evident increasing demand for a quality resident workforce. The direction policy formation takes, and the extent to which industry is included in determining that policy, may be the deciding factor for the future income and employment patterns of the State of Alaska.

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